

HR-287 Strengthening Existing Continuous Composite Bridges

Key Words: Continuous composite bridges, Post-tensioning,

ABSTRACT

The need for upgrading a large number of understrength and obsolete bridges in the United States is well known, and Iowa has many of the bridges that require upgrading. Iowa began designing and constructing continuous span, composite bridges earlier than other states, and consequently, there are many such bridges in Iowa. Because of changes in bridge design standards and increases in truck loads, a considerable number of the continuous, composite bridges in Iowa require posting for reduced loads.

The posted bridges, if in otherwise good condition, often can be strengthened at a cost considerably less than replacement cost. Because strengthening should be based on adequate testing and design information, the research described in this report was conducted to investigate the potential of strengthening continuous bridges by post tensioning.

The research program conducted and described in this report included the following: a literature review, selection and rating of a prototype continuous composite bridge, tests of a one third scale continuous composite bridge model, finite element analysis of the bridge model, and tests of a full scale composite beam mockup for a negative moment region.

The research program indicated that the strengthening of continuous, composite bridges is feasible. The primary objective in applying the post tensioning should be to provide moments opposite to those produced by live and dead loads. Longitudinal distribution of that post tensioning always must be considered if only exterior or only interior beams are post tensioned. Testing and finite element analysis showed that post tensioning of positive moment regions with straight tendons was more effective than post tensioning negative moment regions with straight tendons. Changes in tension in tendons may be either beneficial or detrimental when live loads are applied to a strengthened bridge and thus must be carefully considered in design.